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**Thesis:** Transient Modeling and Construction of a Fluid Based Electrocaloric Effect (ECE) Refrigeration Cycle

# Motivation

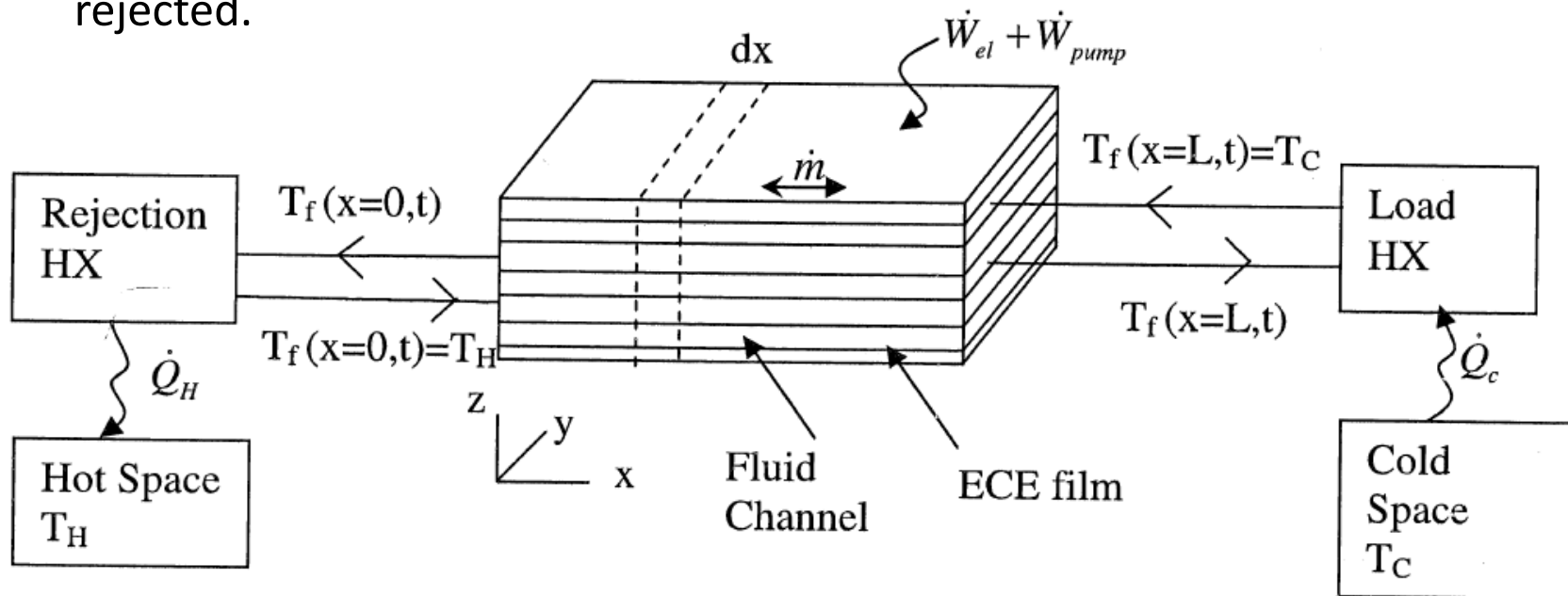
- Demonstrate the feasibility of a fluid based electrocaloric refrigeration cycle
- ECE refrigeration has a higher potential COP than traditional cooling methods
- ECE refrigeration could eliminate environmentally harmful refrigerants

# Electro Caloric Effect

- When an external electric field is applied, the molecules of the ECE material align and the material's entropy decreases.
- The decrease in entropy results in an increase in temperature and a rejection of energy.
- Next, the external field is turned off and the molecules dis-align, therefore, increasing the entropy of the ECE material.
- The increase in entropy lowers the ECE material's temperature and there is an absorption of energy.

# ECE Cycle Operation

- An ECE material temporarily stores thermal energy from liquid water.
- Water is pumped to load heat exchanger and absorbs heat
- Water moves back past the ECE material and the temporarily stored energy is deposited into the water
- The warm water is pumped to the rejection heat exchanger where heat is rejected.



Kinier, Bradly. (2012). *A Thermodynamic Analysis of an Electrocaloric Effect (ECE) Refrigeration Cycle*. (Master's Thesis). University of Wisconsin – Madison.